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Original Research

Comparison of crestal bone loss in Narrow diameter implants with different loading protocols

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ABSTRACT:

Background: Narrow-diameter implants (NDI) would be beneficial to decrease the rate of augmentations necessary for implant insertion. This might help especially elderly patients or patients with general medical risk factors who would benefit from implant therapy with reduced surgical invasiveness. The other important indication, for which NDI would be beneficial, are small inter-dental or interimplant gaps, which are often found in the premolar or incisor region. Therefore, the employment of NDI (≤ 3.4 mm) might broaden the treatment spectrum and also help to reduce or avoid augmentation procedures. **Material and Method:** A total of 20 implants were placed (10 implants per group) in subjects requiring placement of mandibular. Selected groups were grouped on the basis of loading of implants. The patient was then recalled for follow up for radiographic evaluation which was made at 1week, 3months and 6 months of implant loading for evaluation of crestal bone changes with help of radiographs. **Result:** The result of this says that crestal bone loss around implants which are loaded by following early loading protocol led to lesser bone loss when compared to implants which are loaded by following immediate loading protocol, considering all the other factors remains unchanged.

Key words: Narrow, Diameter, Implant

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INTRODUCTION

The rehabilitation of partially and totally edentulous patients with implant-supported prostheses has become common practice in the last few decades, with reliable long term results.[1] Historically, implants have been used and documented mainly with diameters between 3.75 mm and 4.1 mm.[2]Some clinical rehabilitation scenarios represent a challenge for clinicians, as reduced bucco-lingual and mesio distal dimension may not allow the placement of a standard diameter implant. In this sense, narrow diameter implants (<3.4) represent an alternative treatment option in areas with limited space.[3] Implant survival rates reported in the literature are often higher than 90%, irrespective of: (i) the type of implant used; (ii) the implant dimensions; and (iii) the macro and micro morphology of the implants used.[1]

Narrow-diameter implants (NDI) would be beneficial to decrease the rate of augmentations necessary for implant insertion. This might help especially elderly patients or patients with general medical risk factors who would benefit from implant therapy with reduced surgical invasiveness. The other important indication, for which NDI would be beneficial, are small inter-dental or interimplant gaps, which are often found in the premolar or incisor region. Therefore, the employment of NDI (≤ 3.4 mm) might broaden the treatment spectrum and also help to reduce or avoid augmentation procedures.[2] Osseointegrated dental implants are placed traditionally, following a two-stage protocol. With this approach, implants are left to heal unloaded for 3 to 4 months in mandibles and 6 to 8 months in maxillae. Longer and uninterrupted healing time was considered to be essential to avoid a fibrous tissue encapsulation around the implants that might impede or prevent osseointegration.[4] Premature loading of an implant was originally expected to result in fibrous encapsulation and clinical failure. However, histology from experimental studies and of clinically retrieved implants has shown that implants integrate well under loading and may even result in improved integration. In a

clinical histological study, Rocci et al demonstrated histological evidences of successful integration of oxidized titanium implants placed in soft bone and subjected to immediate loading. Moreover, clinical studies have demonstrated an increase of stability as measured with resonance frequency analysis with time for immediately loaded implants, indicating a favourable bone response to the implants.[5]

Nevertheless, some clinicians immediately loaded implants and obtained encouraging results. In 1990, the first longitudinal study was published suggesting that implants could be loaded immediately or early in mandibles of selected patients. Nowadays, implants are commonly loaded immediately and early, particularly in mandibles with good bone quality.[6]

Early loading of dental implants is defined as being between 1 week and 2 months subsequent to implant placement. Immediate loading of dental implants is defined as being earlier than 1 week subsequent to implant placement.[7] Previously numerous study have been performed to assess the performance of narrow diameter implant and immediate loading in conventional implants, but no study has been conducted on narrow implants with immediate loading, therefore, the aim of the present in vivo study is to evaluate narrow diameter implants with immediate loading vs early loading both clinically and radiologically.

MATERIALS AND METHOD

The study was conducted on patients divided into two groups: A total of 20 implants were placed (10 implants per group) in subjects requiring placement of mandibular. Selected groups were grouped on the basis of loading of implants.

Group I Narrow diameter implants with early loading

Group II Narrow diameter implants with immediate loading

Pre-surgical Assessment

Detailed patient history was taken before selecting the patient for procedure. All vital signs were checked and a complete hemogram was done to evaluate the fitness of the patient for implant placement followed by complete oral prophylaxis. Pre-operative IOPA and Cone Beam Computed Tomography (CBCT) provided the necessary information regarding the available bone and distance of vital structures, i. e. mandibular canal and mental foramen from the implant site. An acrylic surgical stent was fabricated based on wax-up to facilitate implant placement.

Surgical preparation:

The patients were pre-medicated with antibiotics (Amoxy-Clav-625 mg). Before anesthetizing the patient, the patients were asked to rinse the mouth with 0.2 % chlorhexidine mouth wash. Local anesthesia was then administered using lignocaine with adrenaline in the ratio of 1:100000 at the involved site.

Implant placement

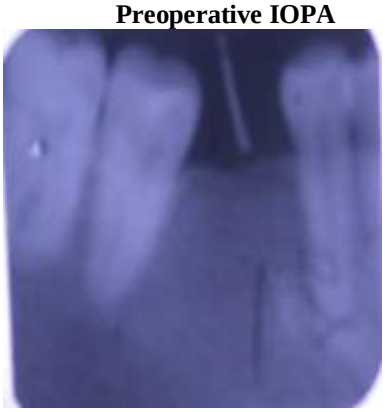
Crestal incision was given for full thickness flap reflection, to expose the implant site. Surgical stent was then placed over the crest to mark the implant site. Implant site was marked to create bleeding point and initial osteotomy. After marking the implant site pilot drill was used, followed by subsequent drills of increasing diameter, and final drill up to the decided depth in order to create an osteotomy site of required dimensions for each patient. The implants were then inserted into this osteotomy site. Healing screws were then screwed to the implants of group I and healing abutments were screwed to the implants of group II immediately after implant placement. Once the healing abutments were placed the surgical site was thoroughly irrigated and flap was closed with tight non-resorbable 3-0 silk sutures and the patients were prescribed with antibiotics and analgesics for 1 week, post-operatively.

Follow up

The patient was then recalled for follow up for radiographic evaluation which was made at 1week, 3months and 6 months of implant loading for evaluation of crestal bone changes with help of radiographs. The standardized periapical radiographs were obtained at immediate post-operative, 1 week, 3 months and at 6 months were digitized using Digimizer Image analysis, Med Calc Software version 4. 3. 5. 0. The known implant length was used to calibrate the images in the computer software. The results obtained were subjected to statistical analysis using Paired T-test.

Pre operative intra oral photographs

Preoperative IOPA



Post operative IOPA

Preoperative IOPA

Post operative IOPA

Post operative intraoral Photograph

RESULTS AND DISCUSSION

The choice of implant diameter depends on the type of edentulousness, the volume of the residual bone, the amount of space available for the prosthetic reconstruction, the emergence profile, and the type of occlusion. Small-diameter implants are indicated in specific clinical situations, for example, where there is reduced interradicular bone or a thin alveolar crest, and for the replacement of teeth with small cervical diameter.[8] Until now, the use of NDI has been restricted to certain defined indications with comparable low occlusive loading like incisors or as retaining elements for overdentures.[2] It has been advocated to use caution in the use of narrow-diameter implants because of the concern regarding the negative impact of loading in these implants, with lower stability when compared to regular platform implants, and increased probability of fracture in clinical practice.[37] In previous review, the majority of investigated studies reported survival rates > 95% and no study reported survival rates below 88%.[2] Immediate loading, early loading and conventional loading are the three main loading protocols in implantology. A recent meta-analysis has already comprehensively compared immediately loaded implants to conventionally loaded implants. The results from that study demonstrated that immediate loading may impose a higher risk for implant failure compared to conventional loading. While early loading protocols (implants loaded 1 week to 2 months after insertion) permit a longer healing time than immediate loading

protocols (implants loaded less than 1 week after insertion).[9]

As previous states that NDIs can be used with confidence where a regular diameter implant is not suitable[10], purpose of this study is to evaluate narrow diameter implants with immediate loading vs early loading both clinically and radiologically.

Present study aimed to compare the radiologic changes in peri-implant bone level in narrow diameter loaded with immediate loading protocol and early loading protocol. The mean of the mesial crestal bone loss at 6 months for implant loaded early was 0.48 ±0.05 mm while it was 0.59±0.12 for the implants loaded immediately. The mean of the distal crestal bone loss at 6 months for implant loaded early was 0.38±0.09mm while it was 0.58±0.14 for implants loaded immediately. The results of the study shows that the crestal bone loss in narrow diameter implants is less than 1mm on follow up of 6 months, which was in accordance with previous studies[1,3]. Chiapasco M[1] and Casentini P conducted a study on narrow diameter implants in 18 patients with a follow up period of 19 months and concluded that in narrow diameter implants, loaded either immediately or delayed the crestal bone loss was found to be in the range of 0 to 1 mm.

They are also in accordance with studies conducted by Galindo-Moreno P[3] and Nilsson P in 2011 who after evaluating 97 implants placed in 69 patients concluded that mean marginal bone loss 1 year after installation was 0.065 mm.

And the results of the study suggest that early loading of narrow diameter implants leads lesser mean marginal bone loss compared to immediate loading of narrow diameter implants.

In fact the result of this study suggest that early loading technique can cause less crestal bone loss compared to immediate loading technique in mandibular posterior region. A result that is supported by study conducted by Fabio Galli and Matteo Capelli in 2008, who placed 25 implants under immediate loading protocol and 27 implants with early loading and concluded that implants loaded early caused lesser crestal bone loss by studying the peri-implant tissue around the implant.

CONCLUSION

Loading protocol plays an important role in success and survival rate of implants. Conventional loading of dental implants have ever promising results and in compliance with all type of clinical conditions. But the main disadvantage is when it comes to the healing time. In order to over come this, research lead to practice of early loading and immediate loading protocols. Still now both immediate and early loading protocol has been practised widely with acceptable success rate with regular diameter implants. This Narrow Diameter implants, which is convenient for the patient, especially for compromised patient with lesser bone for conventional implant placement. The prosthetic phase can start earlier because of lesser healing time. Furthermore, the implants are accessible for clinical monitoring during the osseointegration period. So the aim of this study is to find the results of immediate and early loading protocols in concern with Narrow Diameter Implants.

The result says that crestal bone loss around implants which are loaded by following early loading protocol led to lesser bone loss when compared to implants which are loaded by following immediate loading protocol, considering all the other factors remains unchanged.

With the limitations of the study the results can be concluded that on evaluation of narrow diameter implants with early loading vs immediate loading clinically and radiographically, narrow diameter implants with early loding causes lesser crestal bone loss. Thus it makes early loading protocol more preferable for Narrow Diameter implants.

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